Case Study No. 1 Waterborne Coatings
Accent Furniture
San Bernardino, CA

Background

Accent Furniture manufactures oak bedroom furniture. Their product is a mixture of solid oak and veneered medium density fiberboard (MDF). The manufacturing facility is approximately 80,000 square feet in size and there are two shifts. The day shift consists of approximately 200 employees, 20 of whom are in the finishing department. The night shift, with 60 employees, has only 15 in the finishing department. Accent has an annual production of about $15 million. The switch to a waterborne finishing system was prompted by a need to increase production without exceeding permit limitations.

Product sample

Manufacturing and Coating Operations

Accent receives most of their lumber raw, with the exception of some precut moldings. The pieces are cut and assembled before finishing. The waterborne stains are applied by hand with wet rags. The stain is hand wiped in a circular motion to push the pigment into the wood. Accent may switch all of their staining to spray application with HVLP guns in the future. After staining, the product is lightly sanded to smooth down any grain raise that may have occurred. The waterborne sealer is pumped directly out of the 55-gallon drum and applied using HVLP guns in a spray booth. Sealer can be applied before the stain is completely dry without lowering the quality of the finish. The sealer then is lightly sanded. Because Accent desires a very natural finish, no topcoat is applied. However, to protect the finish, a low-VOC wax is hand rubbed into the finish. The staging area is equipped with several fans to ensure that the product is completely dry before it is packaged.

Application of hand-wiped stain

Gluing Operations

Accent had been using a solvent-borne, but low-VOC, glue. However, after changing to the waterborne stain and sealer, they tested several alternative glues. A waterborne, white wood glue was found to adhere better in conjunction with the new waterborne coatings. All assembly now is done with the waterborne glue.

Application of sealer

Cleaning Operations

Accent produces very little waste from cleaning the waterborne coating application equipment. The guns are not drained, and leaving the coating in them prevents the need to clean them daily. Any necessary cleaning of tips or guns is done with hot water.

Previously, Accent was hand wiping solvent-borne stains. This produced a large number of rags (around 10 to 12 thousand per week). These rags were collected and sent to a laundry service so they could be reused. With the waterborne system, Accent hopes to reduce the number of rags to 100 per week and launder them in-house.

Another benefit of the waterborne finishing system is filter disposal. Used spray booth filters can be thrown into the dumpster. With the solvent-borne system, the used filters had to be wetted and Accent paid a disposal company to haul them away.

Conversion to Waterborne Coatings

In 1993, Accent began using a high-solids system. In 1998, it became apparent that coating emissions had to decrease in order to expand operations under the current permit, and Accent decided to be proactive and switch to an alternative type of coating, rather than simply reformulate their coatings again or install an add-on control device. After researching the alternative low-VOC coatings that were available, Accent decided to use a waterborne system. This decision was based on many factors including: the dramatic decrease in VOC content (as compared to their high-solids system), improved working environment, affordability of the system, and the reduced fire risk.

Accent was concerned with the possibility of grain raise with the waterborne coatings. A waterborne product had been tested in 1995, but the finish was of very poor quality with excessive grain raise. Several of the manufacturers that Accent contacted had waterborne systems that were extremely complex and required several extra steps in the finishing process. These additional steps would alleviate the grain raise problem, but would require more time and manpower per piece than the current solvent-borne system. Accent then was contacted by a new supplier, Western EcoTec, who promised their product would provide a simple system without the problems Accent had

experienced before. Although the waterborne system requires a sanding step after the stain is applied, this has not added a step to the finishing line. Accent was previously sanding before staining, and has found that eliminating that presanding step (while adding the sanding after staining) does not compromise the finish. Only the solid oak components are presanded.

The finish Accent achieved with the Western EcoTec system is quite satisfactory. The grain raise is minimal - slightly more than with the solvent-borne product they had been using, but definitely acceptable. The waterborne system produces a better color than the solvent-borne system and is easier to sand. The color is matched so closely, the product finished with the waterborne system is almost indistinguishable from the product finished with the previous system. The consistency also is excellent. While the color is not quite as deep as it was with the solvent-borne system, the difference is minimal, and Accent feels it is worth the environmental and safety benefits.

The main problem Accent encountered with the waterborne finishing system was retraining the operators to apply the waterborne coatings. For example, the waterborne stain needs to be rubbed into the product in a circular motion to work the pigment into the wood, something that was not necessary for the solvent-borne system. In addition, the waterborne sealer cannot be applied as heavily as the solvent-borne sealer. However, once the operators had a chance to adjust to the new system, they found the elimination of the solvent odor and ease in removing any stain that was spilled on their hands or clothing to be well worth the adjustment in application technique.

Benefits of the waterborne system include: better work environment for the employees, lower fire risks, affordable implementation, and elimination of the need to increase the permit limit to expand their business. Another important benefit is the customer reaction. Before changing to the waterborne system, Accent would periodically receive a return because the customer complained that the product smelled funny when they removed it from the box. The customer was smelling the odor associated with solvent-borne coatings that is not present in a waterborne finishing system.

Costs

The costs to implement the system were minimal, only a few thousand dollars. Only a few pieces of new equipment were required. The old spray guns needed to be replaced with HVLP guns, and some of the hoses and filters were replaced. The current pumps were acceptable, but may be replaced at a later date. Other possible future expenses include a drying oven and/or dehumidifier to further reduce the drying time.

Accent did note a significant increase in the cost of the coatings themselves. The waterborne coatings cost approximately 70 percent more than the solvent-borne system Accent had been using. However, Accent's fire insurance decreased and cleaning service charges associated with the solvent-borne rags are expected to be

eliminated. Although this still makes the waterborne system more expensive to operate, Accent feels the extra cost is well worth the safety and environmental benefits.

Emissions

Facility personnel stated that when they were using the solvent-borne system, Accent was operating at their monthly permit limitation, 1,800 pounds of VOCs, preventing expansion without increasing their permit limit. Using the waterborne system has approximately halved Accent's monthly emissions, allowing them to increase production under their current permit. Accent is subject to the Wood Furniture NESHAP, although their switch to waterborne coatings has significantly reduced their HAP emissions.